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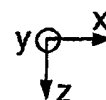
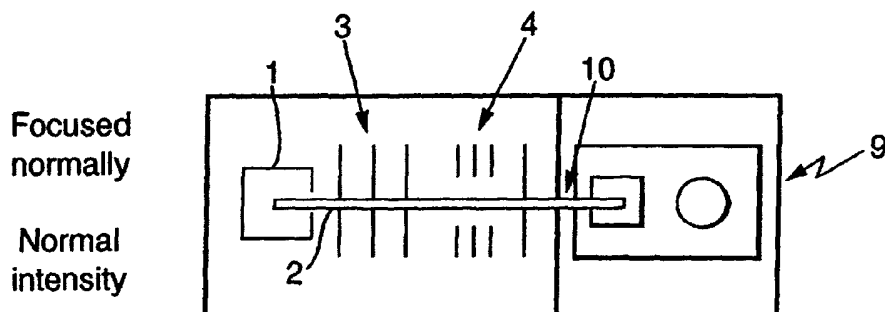
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(54) **Mass spectrometer and methods of mass spectrometry**

(57) A way of increasing the dynamic range of a mass spectrometer which incorporates a time to digital converter such as commonly used with a time of flight mass analyser 9 is disclosed. A z-lens 4 upstream of the analyser 9 can be switched between a high sensitivity mode wherein a beam of ions 2 passing therethrough is substantially focused on to the entrance slit 10 of the

analyser 9, and a low sensitivity mode wherein the beam of ions 2 is defocused so that the diameter of the beam substantially exceeds that of the entrance slit 10 of the analyser 9. Obtaining data in the low sensitivity mode in combination with obtaining data in the high sensitivity mode enable an order of magnitude increase in the dynamic range to be obtained.

**Fig.2(a).**





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# EUROPEAN SEARCH REPORT

Application Number  
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (InLCI.7)
X	US 5 300 774 A (BUTTRILL JR S E) 5 April 1994 (1994-04-05)	1, 7-9, 12, 33	H01J49/40 H01J49/06
Y	* abstract *	1, 18, 20, 24, 26, 27, 31, 32, 34	
A	* claims 1-5 *	13	
Y	US 5 747 800 A (MOCHIZUKI KOHEI ET AL) 5 May 1998 (1998-05-05)	1, 18, 20, 24, 26, 27, 31, 32, 34	
	* column 4; figure 2 *		
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			H01J
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		3 March 2004	Hulne, S
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 01 31 0018

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03-03-2004

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5300774 A	05-04-1994	DE 69230174 D1	25-11-1999
		DE 69230174 T2	15-06-2000
		EP 0587707 A1	23-03-1994
		JP 7500448 T	12-01-1995
		WO 9219367 A1	12-11-1992
US 5747800 A	05-05-1998	JP 3385327 B2	10-03-2003
		JP 9161720 A	20-06-1997
		DE 19650542 A1	19-06-1997

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